1420 King Street, Suite 600, Alexandria, Virginia 22314

December 16, 1999

Mr. Nan Gowda
USEPA Region V
77 West Jackson Blvd.
HSF5J
Chicago, IL 60604-3590

Reference: Replacement Pages
Final Phase II Property Assessment Report—VAP Sites
Air Force Plant 85
Columbus, Ohio

Telephone
703.549.8728
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703.549.9134

Dear Mr. Gowda:

Enclosed please find one copy of selected replacement pages for the following finalized document for the environmental restoration at Air Force Plant 85:

Phase II Property Assessment Report, dated November 1999

After distribution of the final document, Earth Tech determined that some groundwater standards were inadvertently missing from the standards section, as well as Section 4 which discusses the comparison between the analytical results and the standards. As a result of this most recent comparison, three sites require further investigation, in addition to the six sites previously identified. I sincerely hope this does not inconvenience you and apologize for the discrepancy. If you have any questions or comments you would like to discuss or require additional information, please feel free to contact me at (703) 549-8728, extension 555.

Very truly yours,

EARTH TECH, INC.

Judith M. Gallagher, P.E.
Senior Engineer

Enclosure

cc: ASC/EM (Capt. Irvine)

Table 2.1-2
Generic Unrestricted Potable Use Standards for Groundwater (μg/L)

Chemical of Concern	Noncarcinogens	Carcinogens	MCL	Generic Unrestricted Potable Use Standard*
Acenaphthene	680	--	--	680
Acenaphthylene	660	--	--	660
Acetone	1600	--	--	1600
Aluminum	16000	--	--	16000
Anthracene	2600	--	--	2600
Antimony	6.2	--	6.0	6.0
Benzo(a)anthracene	--	0.29	--	0.29
Benzo(b)fluroanthene	--	0.21	--	0.21
Benzo(k)fluoranthene	--	1.8	--	1.8
Benzo(a)pyrene	--	0.021	0.2	0.021
Benzo(g,h,I)perylene	63	--	--	63
Beryllium	31	--	4.0	4.0
n-butylbenzene	1800	--	--	1800
Sec-butylbenzene	1600	--	--	1600
Tert-butylbenzene	2100	--	--	2100
Butyl benzylphthalate	2900	--	--	2900
Carbazole	--	62	--	62
Carbon Disulfide	880	--	--	880
Chlorobenzene	280	--	100	100
Chloroethane	6100	--	--	6100
Chloroform	--	--	--	100
4-Chlorotoluene	280	--	--	280
Chrysene	--	29	--	29
m-Cresol	780	--	--	780
o-Cresol	780	--	--	780
p-Cresol	76	--	--	76
Cyanide	310	--	200	200
Dibenz(a,h)anthracene	--	0.0097	--	0.0097
Di-n-butylphthalate	1500	--	--	1500
Dibromochloromethane	310	19	100	19
1,1-Dichloroethane	1500	--	--	1500
1,2-Dichloropropane	320	23	5	23
Diethyl phthalate	12000	--	--	12000
Dimethyl phthalate	12000	--	--	12000
1,1-Dichloroethane	1500	--	--	1500
cis-1,2 Dichloroethene	--	--	70	70
Dichloromethane (Methylene Chloride)	--	--	5.0	5.0
Fluoranthene	300	--	--	300
Fluorene	410	--	--	410

Indeno[1,2,3-c,d]pyrene	--	0.14	--	0.14
Isopropylbenzene	1200	--	--	1200
p-Isopropyltoluene	23000	--	--	23000
Methyl butyl ketone(2-hexanone)	800	--	--	800
1-Methylnaphthalene	2400	--	--	2400
2-Methylnaphthalene	2300	--	--	2300
Phenanthrene	2600	--	--	2600
Pyrene	190	--	--	190
Toluene	--	--	1000	1000
trans-1,2 Dichloroethene	--	--	100	100
1,1,2,2-Tetrachloroethane	--	7.2	--	7.2
1,1,2-Trichloroethane	62	25	5	25
Trichlorofluoromethane	4100	--	--	4100
1,2,3-Trichloropropane	93	0.22	--	0.22
Vinyl acetate	6200	--	--	6200
Phenol	9400	--	--	9400
Total Petroleum Hydrocarbons				
Petroleum Hydrocarbons above C-10	--	--	--	--
Inorganic Compounds				
Antimony	--	--	6.0	6.0
Arsenic	--	--	50	50
Barium	--	--	2000	2000
Beryllium	31	--	4.0	4.0
Cadmium	--	--	5.0	5.0
Chromium	--	--	100	100
Cobalt	940	--	--	940
Mercury	--	--	2.0	2.0
Nickel (soluble salts)	--	--	100	100
Selenium	78	--	50	50
Silver	78	--	--	78
Thallium	1.2	--	2.0	1.2
Vanadium	110	--	--	110
Zinc	4700	--	--	4700

*The Generic Unrestricted Potable Use Standard is the most conservative (lowest) value of the noncarcinogenic carcinogenic, and MCL values.

Key:

-- = No standard
µg/L = Micrograms per liter

Sources:

OAC 3745-300-08, Paragraph (C)(3)(c), Table VII: Generic Unrestricted Potable Use Standards.

Supplemental Generic Numerical Values: Voluntary Action Program Technical Assistance, Unrestricted Potable Use Groundwater (Reference 333 and 340).

4.4.3 Results

Numerous inorganics, VOCs, SVOCs and TPH were detected in the soil samples collected; the detections are summarized in Table 4.4-1. Aroclor-1254 was detected in the two soil samples collected at borehole 3PITDP-05. Table 4.4-2 presents a comparison between the maximum concentration detected and the adjusted VAP standard for each analyte. No concentrations exceeded the respective adjusted VAP soil standards.

During the Winter 99 investigation, five borings were advanced to either 12 feet or 16 feet bgs. The soils encountered were brown silty clay with gravel. No sample was collected at 3-AUTOCPIT for vertical conductivity determination. However, during previous investigations, the vertical conductivity of soils was determined for two other sites in the vicinity of 3-AUTOCPIT. These two sites are 3-DPSHOP and 3-SMPFAB3. The conductivity values were 3.11×10^{-6} cm/s and 3.49×10^{-6} cm/s, respectively. These values are typical of glacial till. Based on the shallow Groundwater encountered in the borings near Building 3 and the soils encountered beneath the 3-AUTOCPIT, leaching to groundwater is probable and will be investigated further in future investigations.

Numerous inorganics exceeding the VAP generic unrestricted potable use standards were detected in the two groundwater samples collected at 3-AUTOCPIT; concentrations and comparisons are presented in Table 4.4-3. The metals include aluminum, cadmium, chromium, nickel, thallium, and vanadium. Figure 4.4-2 shows sample locations and elevated analyte concentrations.

DRO and GRO were not detected in the grab sample collected. However, arsenic, barium, chromium, iron, manganese, lead and zinc were detected. Aroclor-1254 was also detected in the grab sample. Concentrations are presented in Table 4.4-4, and Figure 4.4-2 shows the sample location and analyte concentrations. There is no OEPA standard or background standard for comparison to analytical results for the grab sample. However, a comparison to the City of Columbus sanitary sewer discharge limits was performed. This comparison showed the concentrations of the water in the pits are less than the discharge limits.

The two wipe samples collected from the walls of each pit contained Aroclor-1254. The data are presented in Table 4.4-5. Concentrations did not exceed the OEPA Industrial Cleanup Limit of 100 $\mu g/100\ cm^2$.

4.4.4 Data Validation Summary

Eleven soil samples, two soil duplicates, two groundwater samples and one liquid grab sample were collected at 3-AUTOCPIT and were analyzed for VOCs, SVOCs, PCBs, TPH (GRO and DRO) and inorganics. Two wipe samples were also collected and analyzed for PCBs.

On the basis of concentrations detected in associated blanks, methylene chloride results were qualified as non-detect for five soil samples. Due to blank contamination, n-propylbenzene, m,p-xylene, tert-butylbenzene, sec-butylbenzene, p-isopropyltoluene and n-butylbenzene results were all qualified as non-detect in sample 3PITDP-0101N and 1,2-dichloroethane was qualified as non-detect in sample 3PITGW-02N.

Table 4.4-3

Summary of Analyte Concentrations for Groundwater Samples
Autoclave Pit (3-AUTOCPIT)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	3PITGW-02N 02/23/1999	3PITGW-03N 02/23/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**		
Aluminum	16000	78000	25000
Arsenic	50	9.5	12
Barium	2000	640	370
Cadmium	5	43	10 U
Chromium (Total)	100	130	37
Cobalt	940	61	30
Copper	NA	360	92
Iron	NA	160000	75000
Lead	NA	140	27
Manganese	NA	4000	1600
Nickel	100	250	110
Thallium	1.2	6.8	5 U
Vanadium	110	290	91
Zinc	4700	750	370
Analyte	**Volatiles by SW8260 (ug/L)**		
1,2-Dichloroethane	5	0.29 J	5 U
Acetone	1600	100 U	4.5 J
Chlorobenzene	100	5 U	5 U
Analyte	**Semivolatiles by SW8270 (ug/L)**		
Diethylphthalate	12000	1.3 J	12 U
Fluoranthene	300	12 U	2.2 J

Table 4.4-3

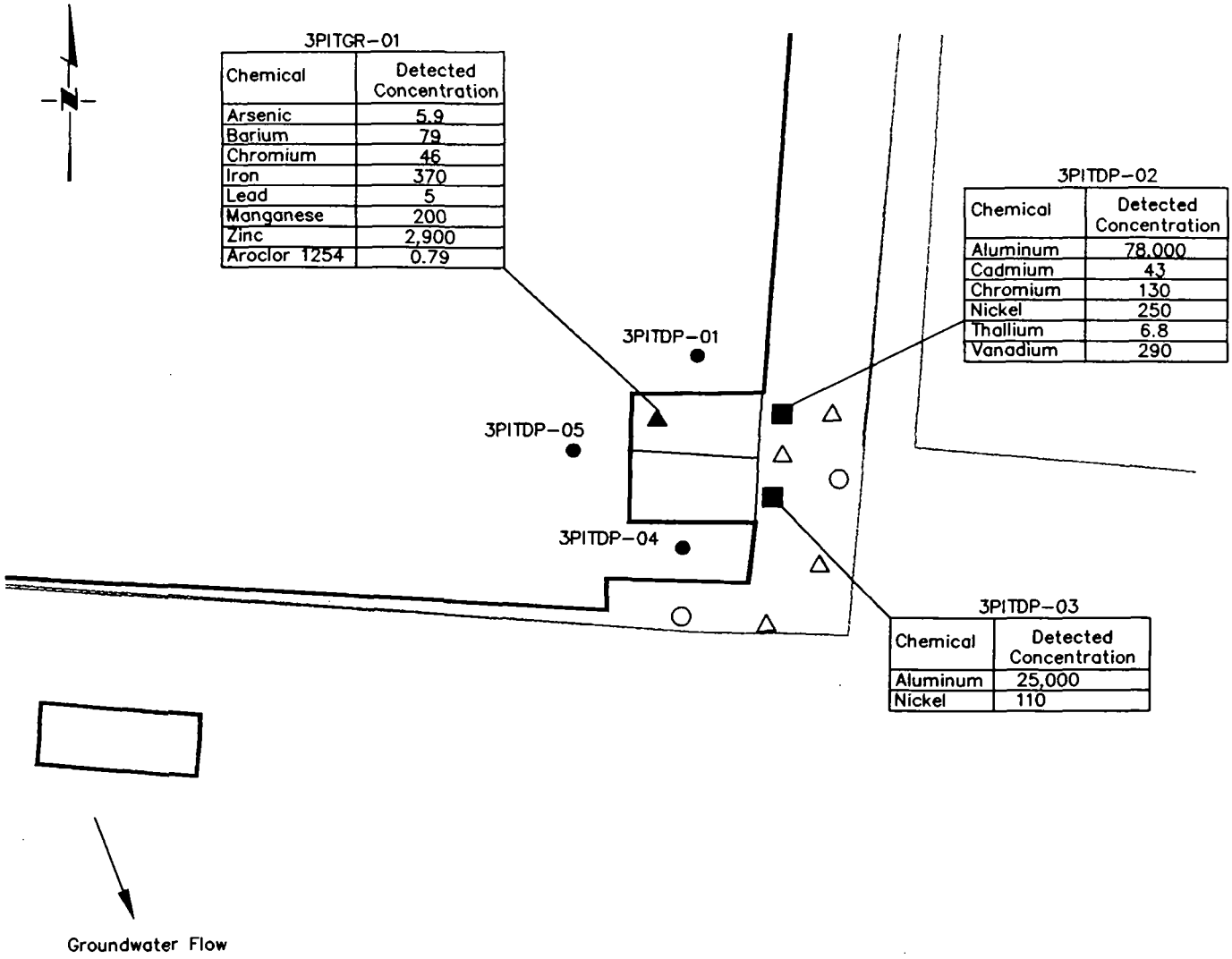
Summary of Analyte Concentrations for Groundwater Samples (Continued)
Autoclave Pit (3-AUTOCPIT)

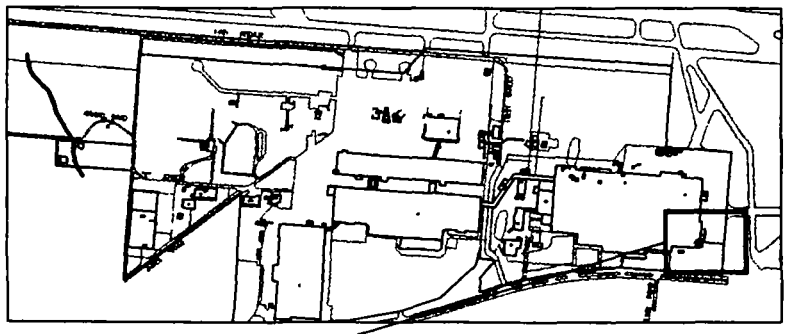
Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	3PITGW-02N 02/23/1999	3PITGW-03N 02/23/1999
Phenanthrene	2600	12 U	1.3 J
Pyrene	190	12 U	1.9 J
Analyte	**TPH by M8015 (ug/L)**		
PHC C16-C32	NA	310 J	570 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter





Legend

- ● Direct Push Sample Location
- ▲ Liquid Grab Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 25' 50' 100'

SCALE

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Figure 4.4-2

Autoclave Pit (3-AUTOCPIT) Groundwater and Liquid Grab Sample Locations and Analyte Concentrations (ug/L)

29179.4.1-5.DWG/PLT

More than 53% of the TPH (GRO and DRO) data points for soil samples were estimated due to low percent recovery of matrix and surrogate spikes.

All soil, groundwater, liquid grab and wipe data points are useable. The following provides a summary of data validation results for samples collected at 3-AUTOCPIT:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
VOCs	884	0	100%	12.4%	1.2%
SVOCs	858	0	100%	4.0%	0%
PCBs	91	0	100%	0%	0%
TPH (GRO and DRO)	26	0	100%	53.9%	0%
Inorganics	286	0	100%	20.3%	0%
Groundwater					
VOCs	136	0	100%	0.7%	0.7%
SVOCs	132	0	100%	3.0%	0%
PCBs	14	0	100%	0%	0%
TPH (GRO and DRO)	4	0	100%	25%	0%
Inorganics	44	0	100%	4.5%	0%
Liquid Grab					
VOCs	68	0	100%	0%	0%
SVOCs	66	0	100%	0%	0%
PCBs	7	0	100%	0%	0%
TPH (GRO and DRO)	2	0	100%	0%	0%
Inorganics	22	0	100%	0%	0%
Wipe					
PCBs	14	0	100%	7.1%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.
(2) The percentage of blank contamination includes both field and laboratory blanks.

4.4.5 Recommendations for Further Action

As discussed in Section 4.4.3, aluminum, cadmium, chromium, nickel, thallium, and vanadium were detected in groundwater at concentrations that exceeded VAP generic unrestricted potable use standards.

In accordance with OAC 3745-300-07(D)(2), complete pathways must be determined for 3-AUTOCPIT. The potentially complete pathway is exposure to groundwater containing chemicals of concern. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.

To determine whether contaminants in soil are leaching to groundwater, additional soil and groundwater sampling is recommended in the vicinity of the elevated inorganics hits. Two boreholes are recommended within a 10-foot radius of each of the contaminated sample locations (3PITDP-02, 3PITDP-03) for a total of four boreholes. Boreholes will be drilled to groundwater, samples will be collected every 5 feet, and groundwater will be sampled. Samples will be analyzed for aluminum, cadmium, chromium (total), nickel, thallium, and vanadium. Proposed sample locations are shown in Figure 4.4-2. In addition, a well should be installed 10 feet downgradient of each of the contaminated sample locations for a total of two wells.

If groundwater sampling analytical results indicate chemicals of concern exceed the unrestricted potable use standards, there are two choices. The first choice is to use institutional or engineering controls to prevent human exposure to chemicals of concern or to remediate groundwater. The second choice is to classify the groundwater. On the basis of groundwater classification, a different set of cleanup requirements will be determined.

The additional groundwater sampling will determine the horizontal and vertical extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

Based on field observations and analytical results, the following is recommended if the owner or appropriate regulatory authority determines that any remaining liquid contained in the autoclave pit is solid waste: pump any remaining liquid out of the autoclave pit, and dispose of it in accordance with applicable regulations.

3-AUTOCPIT is designated Category 7.

4.5.3 Results

Numerous inorganics, VOCs, SVOCs and TPH were detected in soil samples collected at 271-ACVPIT; Aroclor-1260 was detected in one of the six boreholes. The concentrations are presented in Table 4.5-1. Table 4.5-2 presents a comparison between the maximum concentration and the adjusted VAP standard for each detected analyte. Arsenic, TCE, vinyl chloride, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene were detected at concentrations exceeding the adjusted VAP standards. These exceedances were observed in five of the boreholes. Figure 4.5-1 shows the locations and concentrations. Soils encountered were brownish clay with trace silt and gravel. A vertical conductivity value of 1.6×10^{-7} cm/s was reported for the sample 271PITVP-05 collected at 9.5-10.5 feet bgs. This it typical of glacial till unconsolidated deposits. Based on the observed clay content of soils encountered within the 271-ACVPIT borings, and the low conductivity, the potential for contaminant leaching to groundwater is limited.

Inorganics, VOCs, SVOCs and TPH were detected in the groundwater sample collected at 271-ACVPIT; concentrations are presented in Table 4.5-3. Aluminum, barium, cadmium, chromium, cobalt, nickel, thallium, vanadium, benzene, trichloroethene, vinyl chloride, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene were detected at concentrations exceeding the VAP generic unrestricted potable use standard. Figure 4.5-2 shows the location of the elevated concentrations.

Numerous inorganics, VOCs and TPH were detected in the liquid grab sample collected at 271-ACVPIT; concentrations are presented in Table 4.5-4. There is no OEPA standard or background standard for comparison to analytical results for the grab sample. However, the concentration of TCE, 190 µg/L, exceeds the VAP generic unrestricted potable use standard.

4.5.4 Data Validation Summary

Eleven soil samples, two soil duplicates, one groundwater sample and one liquid grab sample were collected at 271-ACVPIT and were analyzed for VOCs, SVOCs, PCBs, TPH (GRO and DRO) and inorganics.

On the basis of concentrations detected in associated blanks, methylene chloride results were qualified as non-detect for six soil samples, acetone results for seven soil samples, toluene results for one soil sample (271PITDP-0602N), n-hexane results for one groundwater sample (271PITGW-01N) and hexachlorobutadiene results for one soil sample (271PITDP-0601N). Methylene chloride, trans-1,2-dichloroethene and 1,2-dichloroethane were detected in associated blanks, therefore, results in the grab sample (271PITGR-01N) were qualified as non-detect.

More than 65% of the TPH (GRO and DRO) data points for soil samples were estimated due to low percent recovery of matrix and surrogate spikes.

Non-detect results for antimony were qualified R and rejected for thirteen soil samples due to low percent recovery of matrix spikes and a high RPD between matrix spike and matrix spike duplicate results.

Table 4.5-3

Summary of Analyte Concentrations for Groundwater Samples
Thermodynamics Lab 271 (271-ACVPIT)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	271PITGW-01N 02/24/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**	
Aluminum	16000	190000
Barium	2000	2500
Cadmium	5	13
Chromium (Total)	100	410
Cobalt	940	210
Copper	NA	4200
Iron	NA	490000
Lead	NA	410
Manganese	NA	7800
Nickel	100	630
Thallium	1.2	10
Vanadium	110	460
Zinc	4700	2300
Analyte	**Volatiles by SW8260 (ug/L)**	
1,1-Dichloroethene	7	0.99 J
1,3,5-Trimethylbenzene	28000	13
Acetone	1600	9 J
Benzene	5	5.4
Chlorobenzene	100	5 U
cis-1,2-Dichloroethene	70	38
Ethylbenzene	700	2.5 J

Table 4.5-3

Summary of Analyte Concentrations for Groundwater Samples (Continued)
Thermodynamics Lab 271 (271-ACVPIT)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	271PITGW-01N 02/24/1999
Isopropylbenzene	1200	0.67 J
m-Xylene	NA	1.7 J
Methylene Chloride	5	2.8 J
n-Hexane	840	1.3 J
o-Xylene	NA	4.2 J
p-Cymene	23000	30
Toluene	1000	1 J
trans-1,2-Dichloroethene	100	14
Trichloroethene	5	43
Vinyl Chloride	2	13
Analyte	**Semivolatiles by SW8270 (ug/L)**	
2-Methylnaphthalene	2300	6 J
Acenaphthene	680	13 J
Benzo(a)anthracene	0.29	3.5 J
Benzo(a)pyrene	0.021	2.7
Benzo(b)fluoranthene	0.21	2.5 J
Benzo(k)fluoranthene	1.8	2.5 J
bis(2-Ethylhexyl)phthalate	NA	3.8 J
Chrysene	29	5.2 J
di-n-Butylphthalate	1500	3.6 J
Fluoranthene	300	11 J
Fluorene	410	17 U

Table 4.5-3

Summary of Analyte Concentrations for Groundwater Samples (Continued)
Thermodynamics Lab 271 (271-ACVPIT)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	271PITGW-01N 02/24/1999
Phenanthrene	2600	44 U
Pyrene	190	9.4 J
Analyte	**TPH by M8015 (ug/L)**	
PHC as Gasoline	NA	1100
PHC C16-C32	NA	16000

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

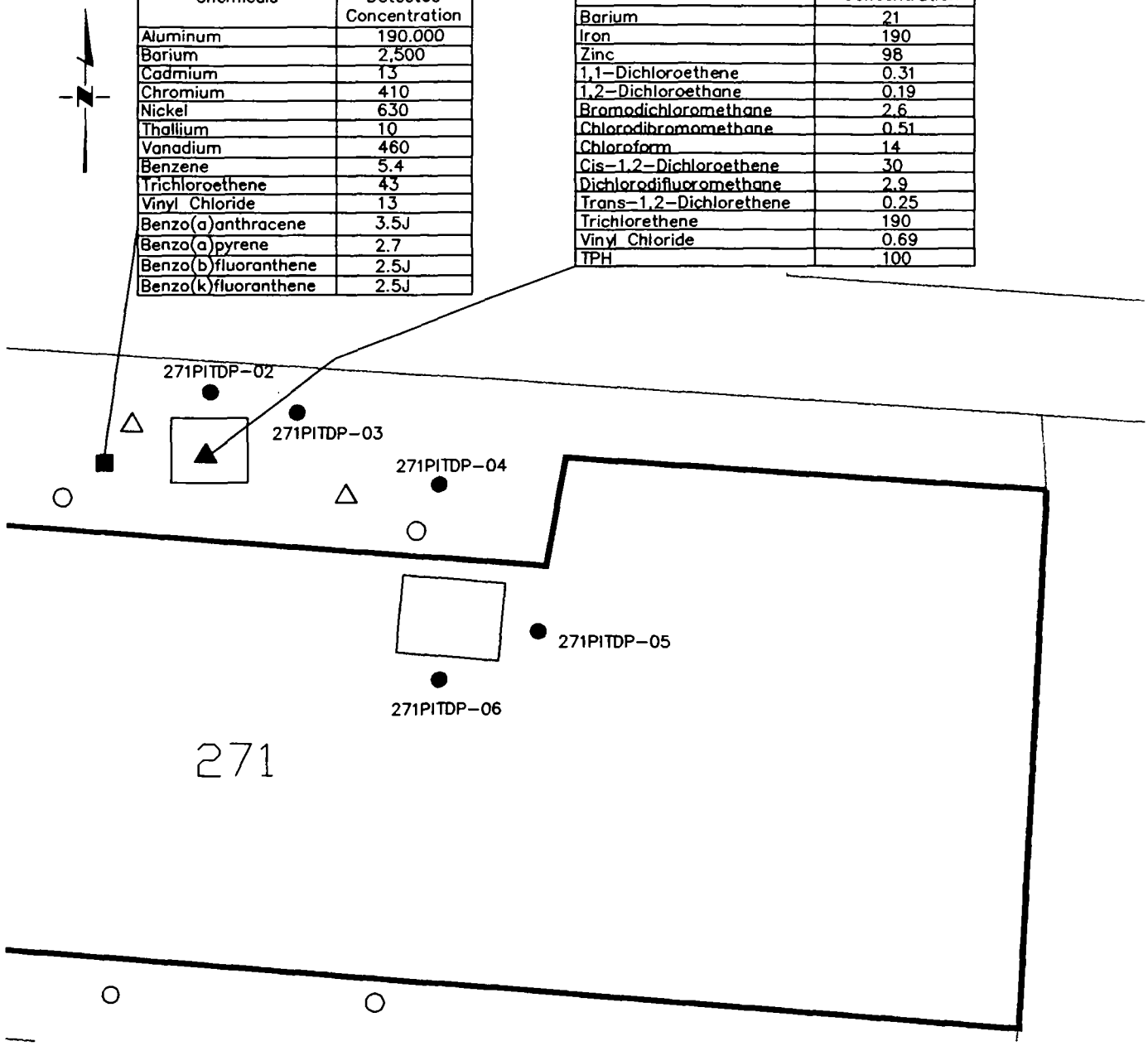
J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter

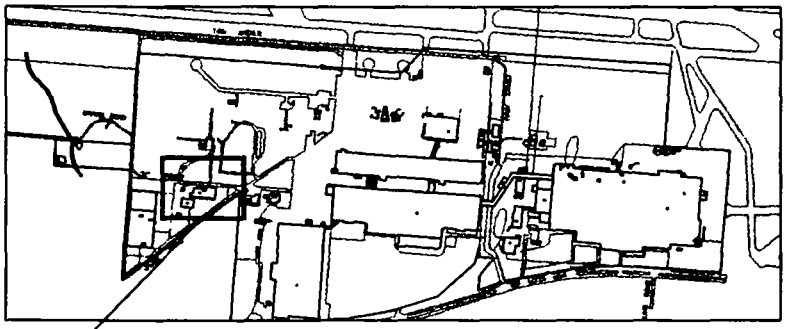
271PITDP-01

Chemicals	Detected Concentration
Aluminum	190.000
Barium	2,500
Cadmium	13
Chromium	410
Nickel	630
Thallium	10
Vanadium	460
Benzene	5.4
Trichloroethene	43
Vinyl Chloride	13
Benzo(a)anthracene	3.5J
Benzo(a)pyrene	2.7
Benzo(b)fluoranthene	2.5J
Benzo(k)fluoranthene	2.5J

271PITGR-01

Chemicals	Detected Concentration
Barium	21
Iron	190
Zinc	98
1,1-Dichloroethene	0.31
1,2-Dichloroethane	0.19
Bromodichloromethane	2.6
Chlorodibromomethane	0.51
Chloroform	14
Cis-1,2-Dichloroethene	30
Dichlorodifluoromethane	2.9
Trans-1,2-Dichlorethene	0.25
Trichlorethene	190
Vinyl Chloride	0.69
TPH	100





Area of Interest

Legend

- ● Direct Push Sample Location
- ▲ Liquid Grab Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 15' 30' 60'

SCALE

EARTH TECH

Figure 4.5-2

Thermodynamics Lab 271 (271-ACVPIT) Groundwater and Liquid Grab Sample Locations and Analyte Concentrations (ug/L)

29178.4.1-5.DWG/PLT

All groundwater, liquid grab and wipe data points are useable. All soil sample data points are useable except for the rejected results described above. The following provides a summary of data validation results for samples collected at 271-ACVPIT:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
VOCs	884	0	100%	7.6%	1.7%
SVOCs	858	0	100%	5.6%	0%
PCBs	91	0	100%	1.1%	0%
TPH (GRO and DRO)	26	0	100%	65.3%	0%
Inorganics	286	13	95.5%	28.3%	0%
Groundwater					
VOCs	68	0	100%	11.8%	2.9%
SVOCs	66	0	100%	16.7%	0%
PCBs	7	0	100%	0%	0%
TPH (GRO and DRO)	2	0	100%	0%	0%
Inorganics	22	0	100%	4.5%	0%
Liquid Grab					
VOCs	68	0	100%	8.8%	0%
SVOCs	66	0	100%	1.5%	0%
PCBs	7	0	100%	0%	0%
TPH (GRO and DRO)	2	0	100%	0%	0%
Inorganics	22	0	100%	0%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.
(2) The percentage of blank contamination includes both field and laboratory blanks.

4.5.5 Recommendations for Further Action

Based on field observations and analytical results, the following is recommended if the owner or appropriate regulatory authority determines that any remaining liquid contained in the 271-ACVPIT pit is solid waste: pump any remaining liquid out of the pit, characterize it using the TCLP, and dispose of it in accordance with applicable regulations.

As discussed in Section 4.5.3, metals, numerous polycyclic aromatic hydrocarbons (PAHs), benzene, trichloroethene and vinyl chloride were detected in soil and groundwater at concentrations that exceeded VAP standards.

To determine whether contaminants in the pit or surrounding soils are leaching to groundwater, additional soil and groundwater sampling is recommended in the vicinity of the elevated inorganics and VOC hits. Two boreholes are recommended within a 50-foot radius of the contaminated sample location (271PITDP-01) for a total of two boreholes. Since groundwater was reached in the Phase II-Winter 99 field effort at only one borehole location, both proposed boreholes will be drilled to groundwater. Soil samples will be collected every 5 feet, and groundwater will be sampled. Samples will be analyzed for aluminum, arsenic, barium, cadmium, chromium, nickel, thallium, vanadium, benzene, trichloroethene, vinyl chloride,

benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno[1,2,3-c,d]pyrene. Proposed sample locations are shown in Figure 4.5-2. In addition, four wells should be installed hydrologically downgradient of the contaminated sample locations.

In accordance with OAC 3745-300-07(D)(2), complete pathways must be determined for 271-ACVPIT. The potentially complete pathway is exposure to groundwater containing chemicals of concern. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.
- Inhalation of VOCs released from groundwater if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.

If groundwater sampling analytical results indicate any chemicals of concern exceed the unrestricted potable use standards, then there are two choices. The first choice is to use institutional or engineering controls to prevent human exposure to chemicals of concern or to remediate groundwater. The second choice is to classify the groundwater. On the basis of groundwater classification, a different set of cleanup requirements will be determined.

The additional groundwater sampling will determine the horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

271-ACVPIT is designated Category 7.

Table 4.7-3

Summary of Analyte Concentrations for Groundwater Samples
Magnesium Chip Burn Site (IRP Site 1)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	IRP1GW-05N 02/23/1999	USW16GW-01N 02/23/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**		
Barium	2000	170	82
Chromium (Total)	100	20 U	700
Copper	NA	40	35
Iron	NA	86	75
Manganese	NA	330	10 U
Analyte	**Volatiles by SW8260 (ug/L)**		
Chlorobenzene	100	5 U	5 U
Analyte	**Semivolatiles by SW8270 (ug/L)**		
bis(2-Ethylhexyl)phthalate	NA	1.5 J	10 U
Analyte	**TPH by M8015 (ug/L)**		
PHC as Gasoline	NA	100 U	13 J

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
- J = Estimated
- NA = Not available.
- U = Not detected
- ug/L = Micrograms per Liter

Table 4.8-3

Summary of Analyte Concentrations for Groundwater Samples
Coal Pile Leachate Site (IRP Site 2)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	IRP201GW-01N 02/23/1999	IRP202GW-01N 02/22/1999	PG201GW-01N 02/22/1999	USW13GW-01N 02/23/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**				
Barium	2000	35	1200	68	32
Iron	NA	50	860	320	1200
Manganese	NA	3300	110	17	6700
Zinc	4700	20 U	20 U	20 U	26
Analyte	**Semivolatiles by SW8270 (ug/L)**				
bis(2-Ethylhexyl)phthalate	NA	10 U	10 U	48	10 U
Diethylphthalate	12000	1.7 J	1.7 J	10 U	10 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter

Inorganics and TPH were detected in the groundwater sample collected at IRP Site 6; concentrations are presented in Table 4.9-3. Aluminum, beryllium, cadmium, chromium, nickel, thallium, and vanadium were detected at concentrations exceeding the respective VAP generic unrestricted potable use standards. Figure 4.9-2 shows the location of the elevated concentrations.

4.9.4 Data Validation Summary

Seven soil samples, one soil duplicate and one groundwater sample were collected at IRP Site 6 and were analyzed for VOCs, SVOCs, pesticides/PCBs, TPH (GRO and DRO) and inorganics.

On the basis of concentrations detected in associated blanks, methylene chloride results were qualified as non-detect for eight soil samples and hexachlorobutadiene results for one soil sample (IRP6DP-0302N).

Pesticide results for the groundwater sample IRP6GW-01N were all estimated due to the low percent recovery of surrogate spikes.

More than 56% of the TPH (GRO and DRO) data points for soil samples and all groundwater data points for TPH (GRO and DRO) analysis were estimated due to low percent recovery of matrix and surrogate spikes.

All soil and groundwater samples are useable. The following provides a summary of data validation results for samples collected at IRP Site 6:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
VOCs	554	0	100%	3.1%	1.7%
SVOCs	528	0	100%	7.5%	0%
Pesticides/PCBs	224	0	100%	2.2%	0%
TPH (GRO and DRO)	16	0	100%	56.3%	0%
Inorganics	176	0	100%	40.9%	0%
Groundwater					
VOCs	68	0	100%	0%	0%
SVOCs	66	0	100%	13.6%	0%
Pesticides/PCBs	28	0	100%	100%	0%
TPH (GRO and DRO)	2	0	100%	100%	0%
Inorganics	22	0	100%	4.5%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.

(2) The percentage of blank contamination includes both field and laboratory blanks.

Table 4.9-3

Summary of Analyte Concentrations for Groundwater Samples
Rubble Disposal Area (IRP Site 6)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	IRP6GW-01N 02/23/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**	
Aluminum	16000	210000
Arsenic	50	8.9
Barium	2000	1500
Beryllium	4	11
Cadmium	5	30
Chromium (Total)	100	300
Cobalt	940	220
Copper	NA	1100
Iron	NA	790000
Lead	NA	450
Manganese	NA	7500
Nickel	100	1000
Thallium	1.2	21
Vanadium	110	740
Zinc	4700	3700
Analyte	**Volatiles by SW8260 (ug/L)**	
Chlorobenzene	100	5 U
Analyte	**TPH by M8015 (ug/L)**	
PHC C16-C32	NA	340 J

Table 4.9-3

Summary of Analyte Concentrations for Groundwater Samples (Continued)
Rubble Disposal Area (IRP Site 6)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	IRP6GW-01N 02/23/1999

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter

IRP 1

IRP 10

IRP 6

IRP6DP-01

Chemicals	Detected Concentration
Aluminum	210,000
Beryllium	11
Cadmium	30
Chromium	300
Nickel	1000
Thallium	21
Vanadium	740

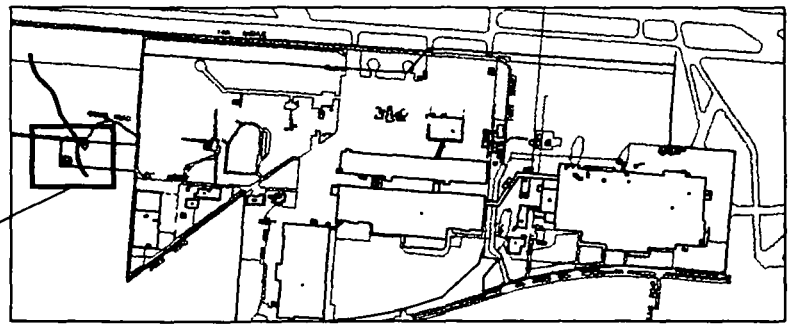
IRP6DP-04

IRP6DP-05

IRP6DP-03

IRP6DP-02

Groundwater Flow



Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 25' 50' 100'

SCALE

EARTH TECH

Figure 4.9-2

**Rubble Disposal Site
IRP Site 6
Groundwater Sample Locations and Analyte Concentrations (ug/L)**

29179.4.6-9.DWG/PLT

4.9.5 Recommendations for Further Action

As discussed in Section 4.9.3, aluminum, beryllium, cadmium, chromium, nickel, thallium, and vanadium were detected in groundwater at concentrations that exceeded VAP generic unrestricted potable use standards.

In accordance with OAC 3745-300-07(D)(2), complete pathways must be determined for IRP Site 6. The potentially complete pathway is exposure to groundwater containing chemicals of concern. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.

To determine whether contaminants in soil are leaching to groundwater or are migrating on AFP85 property from other sources, additional soil and groundwater sampling is recommended in the vicinity of the elevated inorganics hits. Two boreholes are recommended within a 20-foot radius of the contaminated sample location (IRP6DP-01) for a total of two boreholes. Boreholes will be drilled to groundwater, samples will be collected every 5 feet, and groundwater will be sampled. Samples will be analyzed for aluminum, beryllium, cadmium, chromium, nickel, thallium, and vanadium. Proposed sample locations are shown in Figure 4.9-2. In addition, a well should be installed downgradient of the contaminated sample location.

If groundwater sampling analytical results indicate chemicals of concern exceed the unrestricted potable use standards, there are two choices. The first choice is to use institutional or engineering controls to prevent human exposure to chemicals of concern or to remediate groundwater. The second choice is to classify the groundwater. On the basis of groundwater classification, a different set of cleanup requirements will be determined.

The additional groundwater sampling will determine the horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

IRP Site 6 is designated Category 7.

Table 4.11-3

Summary of Analyte Concentrations for Groundwater Samples
Jet Engine Test Cell (270)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	270GW-01N 02/18/1999	270GW-02N 02/18/1999	270GW-04N 02/18/1999	270GW-05N 02/19/1999
Analyte	**Volatiles by SW8260 (ug/L)**				
1,1,1-Trichloroethane	200	5 U	5 U	0.84 J	5 U
1,2,4-Trimethylbenzene	25000	43	5 U	5 U	5 U
1,2-Dichlorobenzene	NA	5 U	5 U	0.33 J	5 U
1,2-Dichloroethane	5	0.36 J	5 U	5 U	5 U
1,3,5-Trimethylbenzene	28000	7.6	5 U	5 U	5 U
2-Hexanone	NA	2.9 J	10 U	10 U	10 U
Acetone	1600	40 J	7.6 J	5.4 J	100 U
Benzene	5	5 U	5 U	0.98 J	5 U
Carbon Disulfide	880	5 U	5 U	0.85 J	5 U
Carbon Tetrachloride	5	5 U	5 U	0.62 J	5 U
Chlorobenzene	100	5 U	5 U	0.76 J	5 U
Ethylbenzene	700	1.1 J	5 U	0.94 J	5 U
Isopropylbenzene	1200	2.6 J	5 U	5 U	5 U
m-Xylene	NA	5 U	5 U	1.8	5 U
Methyl Ethyl Ketone	8600	27 J	3.9 J	5.1 J	2.6 J
Methyl Isobutyl Ketone	800	2.8 J	10 U	10 U	10 U
n-Butylbenzene	1800	9.8	5 U	5 U	5 U
n-Propylbenzene	1300	3.3 J	5 U	5 U	5 U
Naphthalene	NA	11	10 U	10 U	10 U
o-Xylene	NA	5 U	5 U	0.76 J	5 U
p-Cymene	23000	8.4	5 U	5 U	5 U

Table 4.11-3

Summary of Analyte Concentrations for Groundwater Samples (Continued)
Jet Engine Test Cell (270)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	270GW-01N 02/18/1999	270GW-02N 02/18/1999	270GW-04N 02/18/1999	270GW-05N 02/19/1999
sec-Butylbenzene	1600	4.5 J	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	0.88 J	5 U
Toluene	1000	5 U	5 U	1 J	0.25 J
Trichloroethene	5	5 U	5 U	0.98 J	5 U
Analyte	**Semivolatiles by SW8270 (ug/L)**				
1,2-Dichlorobenzene	NA	11 U	10 U	12 U	10 U
2-Methylnaphthalene	2300	5.7 J	10 U	12 U	10 U
bis(2-Ethylhexyl)phthalate	NA	13	6.8 J	5 J	10 U
Diethylphthalate	12000	11 U	10 U	1.2 J	10 U
Naphthalene	NA	11 U	10 U	12 U	10 U
Analyte	**TPH by M8015 (ug/L)**				
PHC as Gasoline	NA	13000	100 U	100 U	100 U
PHC C16-C32	NA	4700	600 U	480 J	550 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
J = Estimated
NA = Not available.
U = Not detected
ug/L = Micrograms per Liter

Table 4.13-3

Summary of Analyte Concentrations for Groundwater Samples
Metal Chip Bailer Sump (125-SUMP)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	125SUMGW-02N 02/09/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**	
Aluminum	16000	7460
Arsenic	50	8.8 J
Barium	2000	265
Chromium (Total)	100	11.9
Copper	NA	15.4 J
Iron	NA	12300
Lead	NA	5.4
Manganese	NA	1280
Nickel	100	29.4 J
Thallium	1.2	1.2 J
Vanadium	110	23.7 J
Zinc	4700	93.3
Analyte	**Mercury (Total) by SW7471 (ug/L)**	
Mercury	2	0.097 J
Analyte	**Volatiles by SW8260 (ug/L)**	
Acetone	1600	6 J
Methylene Chloride	5	0.38 J
Toluene	1000	0.16 J
Trichloroethene	5	0.3 J
Analyte	**TPH by M8015 (ug/L)**	

Table 4.13-3

Summary of Analyte Concentrations for Groundwater Samples (Continued)
Metal Chip Bailer Sump (125-SUMP)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	125SUMGW-02N 02/09/1999
PHC C10-C22	NA	950

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter

4.15.3 Results

Mercury, numerous inorganics, TPH, and VOCs were detected in soil samples collected at PSEWER; concentrations are presented in Table 4.15-1. SVOCs were detected in one of the six boreholes from 0 to 4 feet bgs. Table 4.15-2 presents a comparison between the maximum site concentrations and the adjusted VAP standards. No analyte concentrations exceeded the adjusted standards. Six boreholes were advanced at PSEWER; depths ranged from 8 to 19 feet bgs. The soils encountered varied from gray silty clay to clay, with gravel and trace sand. Groundwater was encountered between 5 and 12 feet bgs. A vertical conductivity value of 2.65×10^{-8} was reported for sample PSEWER-05 collected at 6-8 feet bgs.

Mercury, DRO and numerous inorganics and VOCs were detected in the groundwater sample collected at PSEWER; concentrations are presented in Table 4.15-3. Aluminum, arsenic, thallium and vanadium were detected at concentrations that exceeded the respective VAP generic potable use standard. Figure 4.15-2 shows the location where groundwater samples were collected.

4.15.4 Data Validation Summary

Fourteen soil samples, two soil duplicates and one groundwater sample were collected at PSEWER and were analyzed for VOCs, SVOCs, PCBs, TPH (GRO and DRO) and inorganics.

On the basis of concentrations detected in associated blanks, methylene chloride results were qualified as non-detect for fifteen soil samples and one groundwater sample. Carbon disulfide results were qualified non-detect for one groundwater sample (PSEWERGW-02N) due to field blank contamination.

During SVOC analysis, non-detect results for one soil sample (PSEWERDP-0101N) were rejected due to low percent recovery of surrogate spikes and matrix spikes.

On the basis of concentrations detected in associated laboratory blanks, sodium results were qualified as non-detect for nine soil samples and mercury results were qualified as non-detect in sample PSEWERDP-0301N. More than 48% of the inorganic data points were estimated due to matrix interference and field duplicate precision.

All groundwater data points are useable. All soil data points are useable except for the rejected results described above. The following provides a summary of data validation results for samples collected at PSEWER:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values[1]	Blank Contamination[2]
Soil					
VOCs	560	0	100%	1.5%	2.3%
SVOCs	1024	13	98.7%	1.9%	0%
PCBs	112	0	100%	0%	0%
TPH (GRO and DRO)	32	0	100%	0%	0%
Inorganics	368	0	100%	48.6%	0.5%

Table 4.15-3

Summary of Analyte Concentrations for Groundwater Samples
Process Sewers (PSEWER)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	PSEWERGW-02N 02/19/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**	
Aluminum	16000	248000 D
Arsenic	50	340 D
Barium	2000	410 D
Beryllium	4	1.3
Cadmium	5	0.66
Chromium (Total)	100	49 D
Cobalt	940	250 D
Copper	NA	860 D
Iron	NA	528000 D
Lead	NA	340 D
Manganese	NA	14000 D
Nickel	100	78 D
Thallium	1.2	1.4 M
Vanadium	110	580 D
Zinc	4700	3200 D
Analyte	**Mercury (Total) by SW7471 (ug/L)**	
Mercury	2	1.3
Analyte	**Volatiles by SW8260 (ug/L)**	
Carbon Disulfide	880	0.11 J
Methylene Chloride	5	0.33 J
Toluene	1000	0.14 J

Table 4.15-3

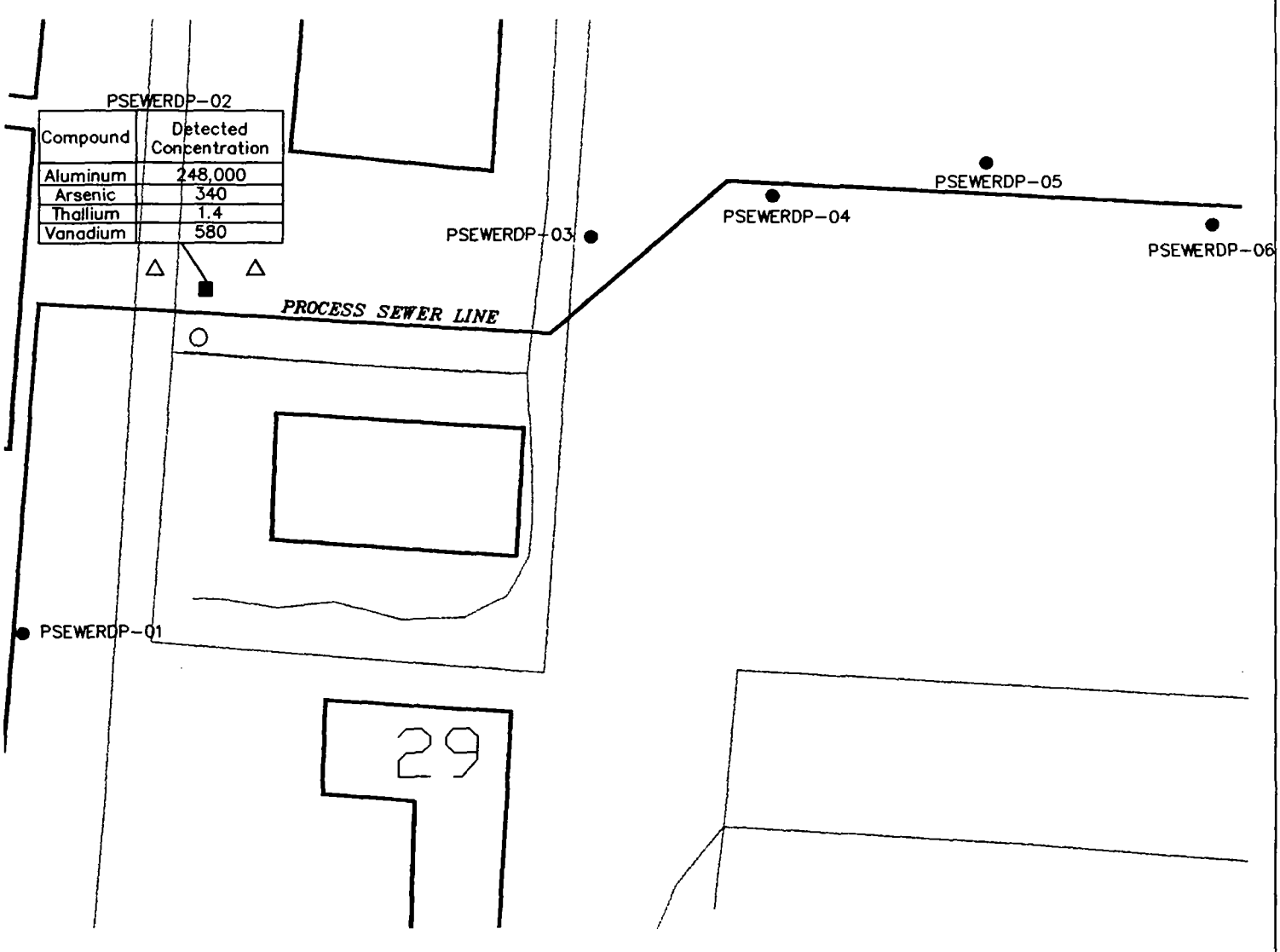
Summary of Analyte Concentrations for Groundwater Samples (Continued)
Process Sewers (PSEWER)

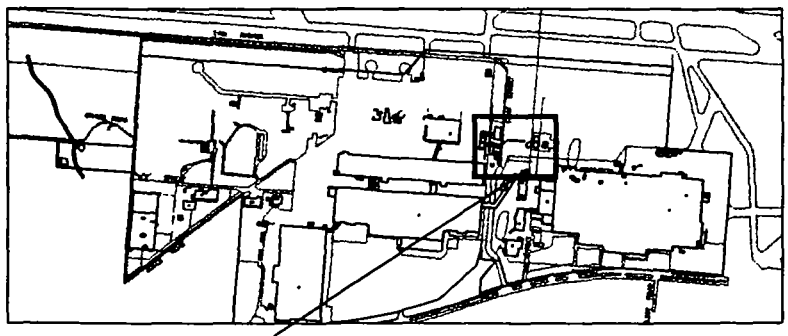
Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	PSEWERGW-02N 02/19/1999
Analyte	**TPH by M8015 (ug/L)**	
PHC C10-C22	NA	290

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

D	=	The analyte was quantified at a secondary dilution factor
J	=	Estimated
M	=	A matrix effect was present
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter





Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 25' 50' 100'

SCALE

EARTH TECH

Figure 4.15-2

Process Sewers (PSEWER) Groundwater Sample Locations and Concentrations (ug/L)

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values[1]	Blank Contamination[2]
Groundwater					
VOCs	35	0	100%	2.9%	5.7%
SVOCs	64	0	100%	14.1%	0%
PCBs	7	0	100%	0%	0%
TPH (GRO and DRO)	2	0	100%	0%	0%
Inorganics	23	0	100%	0%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.
(2) The percentage of blank contamination includes both field and laboratory blanks.

4.15.5 Recommendations for Further Action

As discussed in Section 4.15.3, aluminum, arsenic, thallium, and vanadium were detected in groundwater at concentrations exceeding VAP generic unrestricted potable use standards.

In accordance with OAC 3745-300-07(D)(2), complete pathways must be determined for PSEWER. The potentially complete pathway is exposure to groundwater containing chemicals of concern. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.

To determine whether contaminants in soil are leaching to groundwater or are migrating on AFP85 property from other sources, additional soil and groundwater sampling is recommended in the vicinity of the elevated inorganics hits. Two boreholes are recommended within a 20-foot radius of the contaminated sample location (PSEWERDP-02) for a total of two boreholes. Boreholes will be drilled to groundwater, samples will be collected every 5 feet, and groundwater will be sampled. Samples will be analyzed for aluminum, arsenic, thallium, and vanadium. Proposed sample locations are shown in Figure 4.15-2. In addition, a well should be installed downgradient of the contaminated sample location.

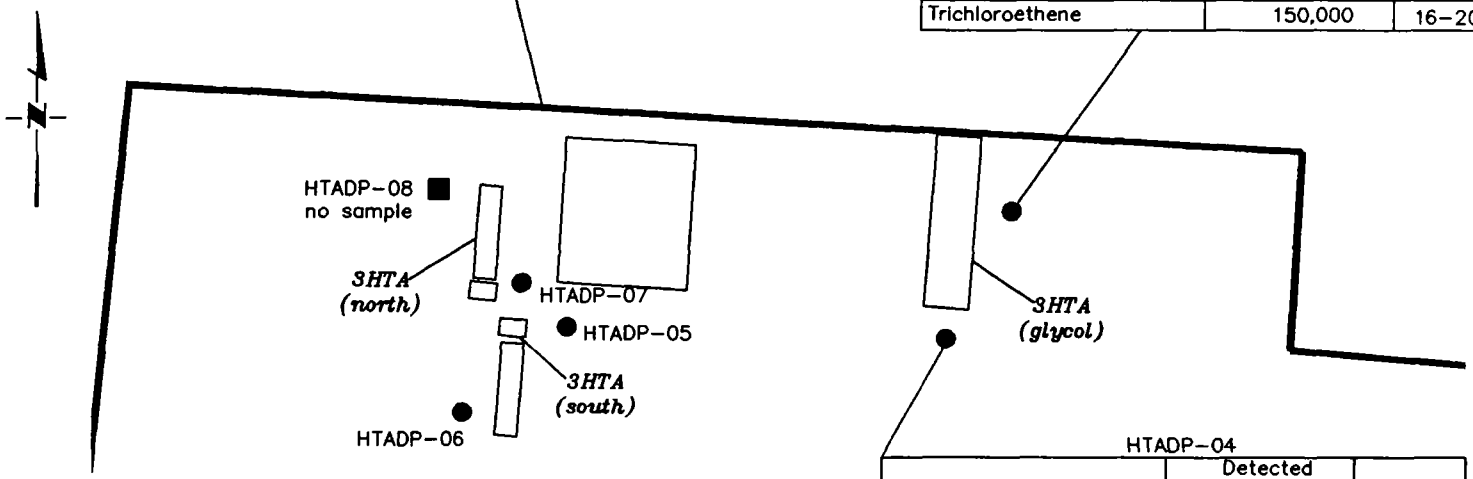
If groundwater sampling analytical results indicate chemicals of concern exceed the unrestricted potable use standards, there are two choices. The first choice is to use institutional or engineering controls to prevent human exposure to chemicals of concern or to remediate groundwater. The second choice is to classify the groundwater. On the basis of groundwater classification, a different set of cleanup requirements will be determined.

The additional groundwater sampling will determine the horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

The PSEWER is designated Category 7.

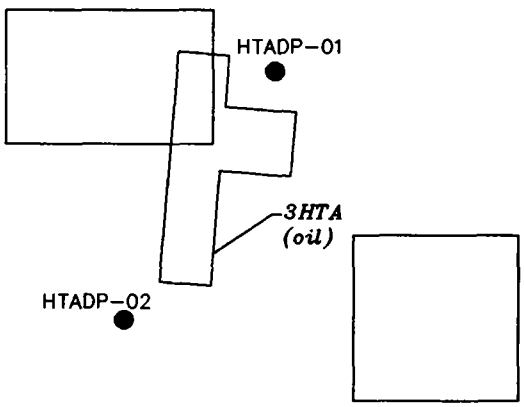
HTADP-03

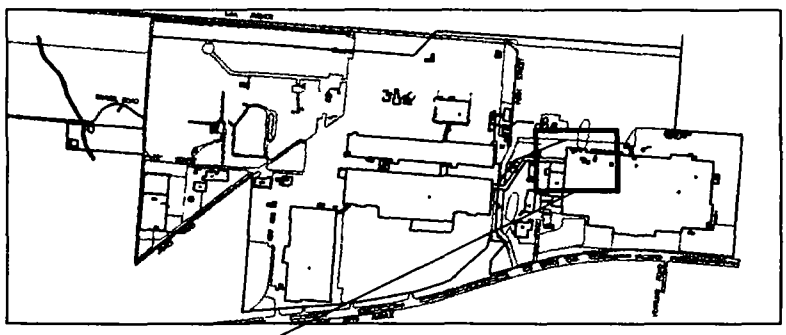
Chemicals	Detected Concentration (ug/kg)	Depth
Trichloroethene	150,000	16-20'



HTADP-04

Chemicals	Detected Concentration (ug/kg)	Depth
Trichloroethene	460,000	8-12'





Area of Interest

Legend

- Direct Push Sample Location

0' 15' 30' 60'

SCALE

EARTH TECH

Figure 4.16-1

Quench Tank Pits (3-HTA) Soil Sample Locations and Analyte Concentrations (ug/kg)

29179.4.16-19.DWG/.PLT

Table 4.16-3

Summary of Analyte Concentrations for Groundwater Samples
Quench Tank Pits (3-HTA)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	HTADP-08GW 02/08/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**	
Aluminum	16000	189 J
Barium	2000	52.8 J
Chromium (Total)	100	44.7
Copper	NA	17.6 J
Iron	NA	4240
Manganese	NA	46.4
Nickel	100	32 J
Zinc	4700	104
Analyte	**Volatiles by SW8260 (ug/L)**	
Acetone	1600	11
Methylene Chloride	5	6.1
Toluene	1000	0.19 J
Trichloroethene	5	0.13 J
Analyte	**Semivolatiles by SW8270 (ug/L)**	
bis(2-Ethylhexyl)phthalate	NA	7.6 J

Table 4.16-3

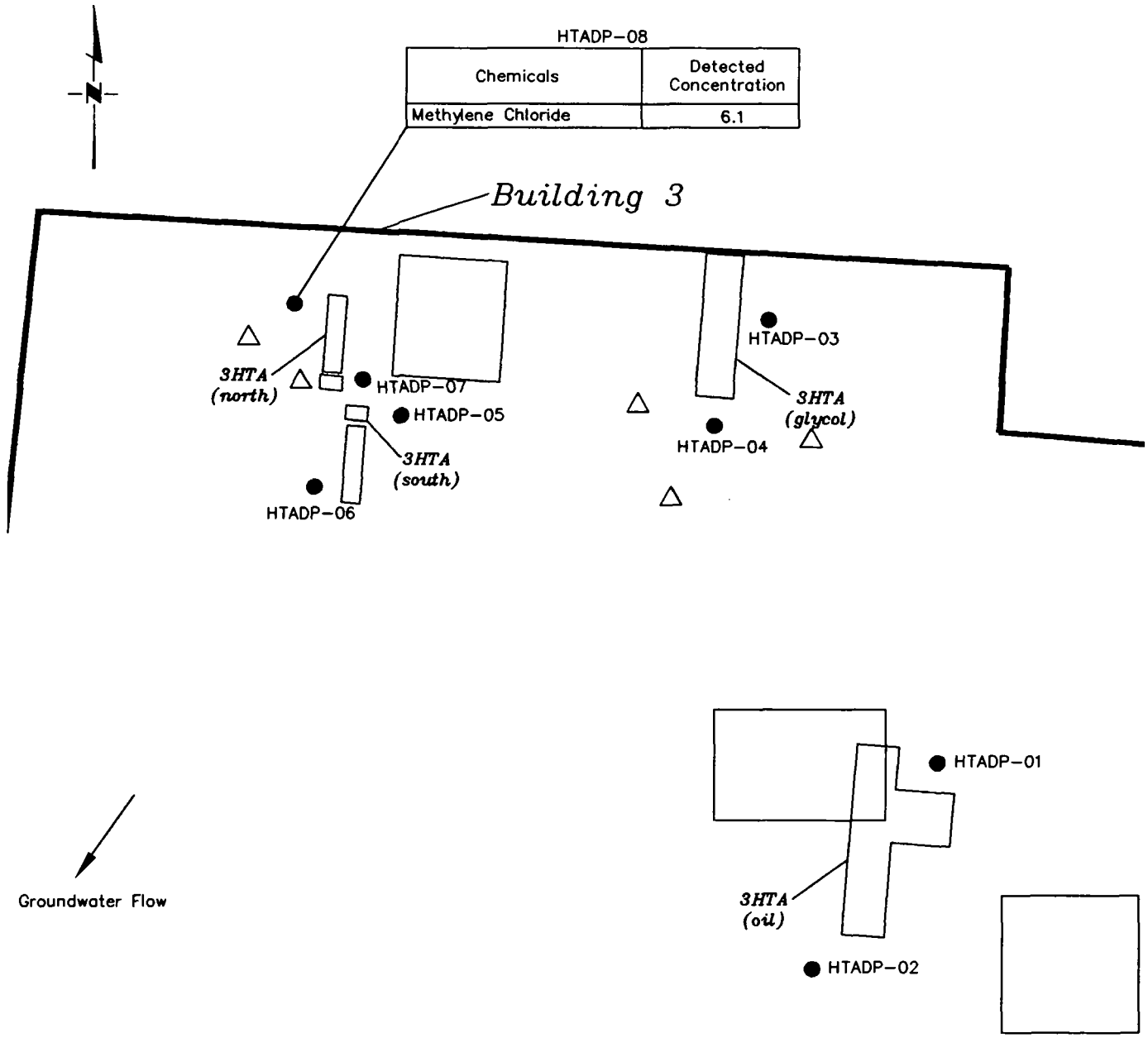
Summary of Analyte Concentrations for Groundwater Samples (Continued)
Quench Tank Pits (3-HTA)

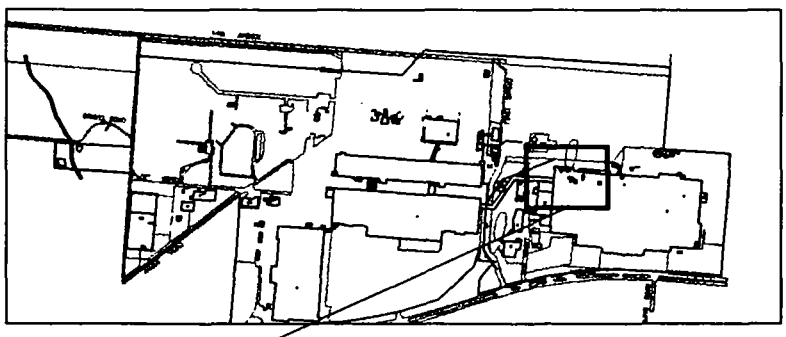
Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	HTADP-08GW 02/08/1999

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter





Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location

0' 15' 30' 60'

SCALE

EARTH TECH

Figure 4.16-2

Quench Tank Pits (3-HTA) Groundwater Sample Location and Analyte Concentrations (ug/L)

29179.4.16-19.DWG/.PLT

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Groundwater					
VOCs	35	0	100%	5.7%	2.9%
SVOCs	64	0	100%	1.6%	0%
TPH (GRO and DRO)	2	0	100%	0%	0%
Inorganics	23	0	100%	0%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.

(2) The percentage of blank contamination includes both field and laboratory blanks.

4.16.5 Recommendations for Further Action

As discussed in Section 4.16.3, TCE is the only analyte detected at a concentration that exceeded adjusted VAP soil standards. Methylene chloride was detected in groundwater at a concentration exceeding the unrestricted potable use standard.

In accordance with OAC 3745-300-07(D)(2), complete pathways must be determined for 3-HTA. The potentially complete pathway is exposure to groundwater containing chemicals of concern which have leached from soil. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.
- Inhalation of VOCs released from groundwater if groundwater is used for bathing/showering or inhaled incidentally during other potable or process use by receptors.

To determine whether TCE in soil is leaching to groundwater and the extent of methylene chloride, additional soil and groundwater sampling is recommended in the vicinity of the elevated TCE hits. Direct push boreholes are recommended within a 10-foot radius of HTADP-04 and HTADP-08. The boreholes should be sampled every 5 feet, advanced to groundwater, and groundwater should be sampled. Samples will be analyzed for TCE and methylene chloride only. Proposed sample locations are shown in Figure 4.16-2.

This additional sampling will determine the vertical and horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted. 3-HTA quench tank pits should remain designated Category 7.

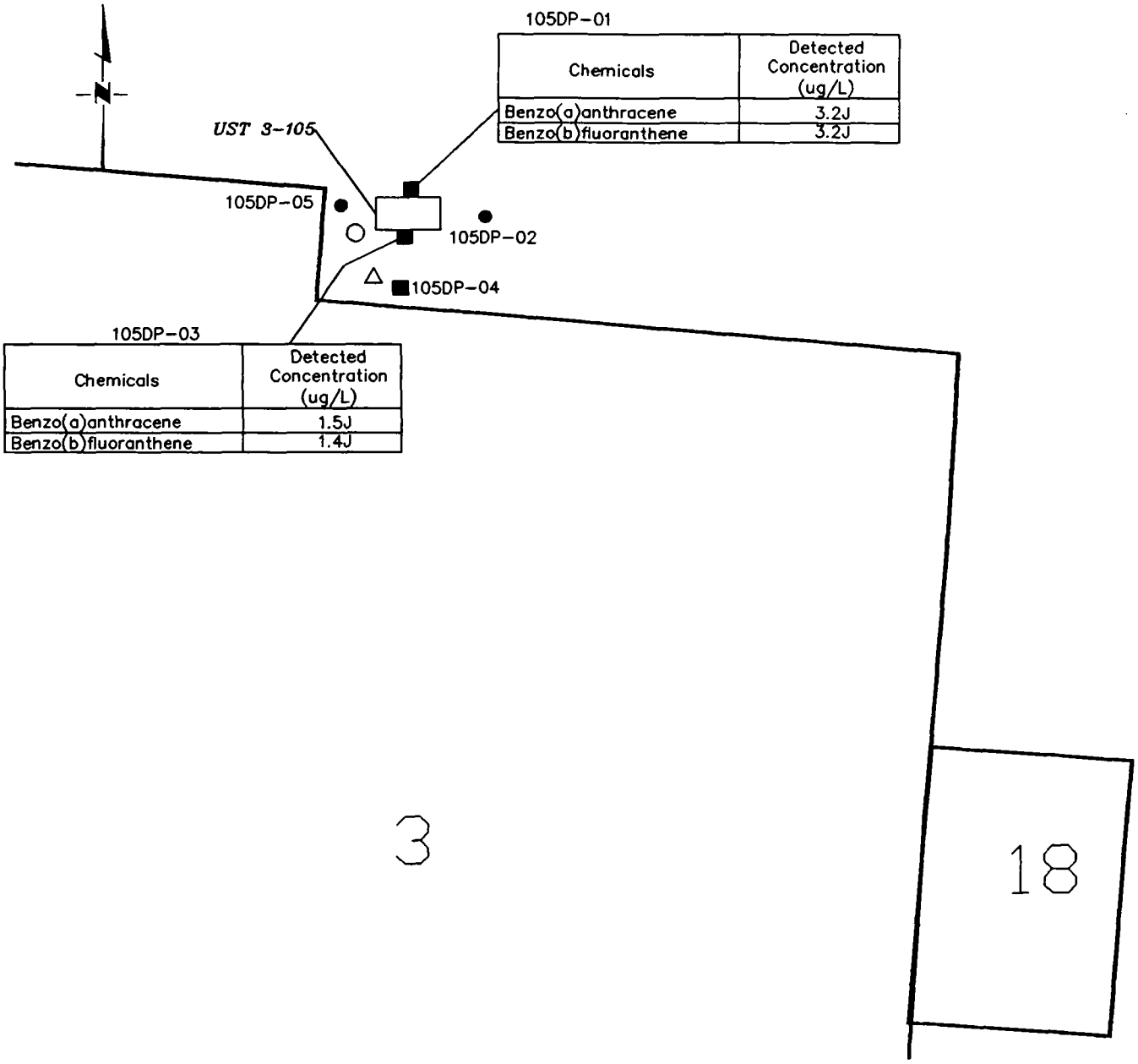
Table 4.19-3

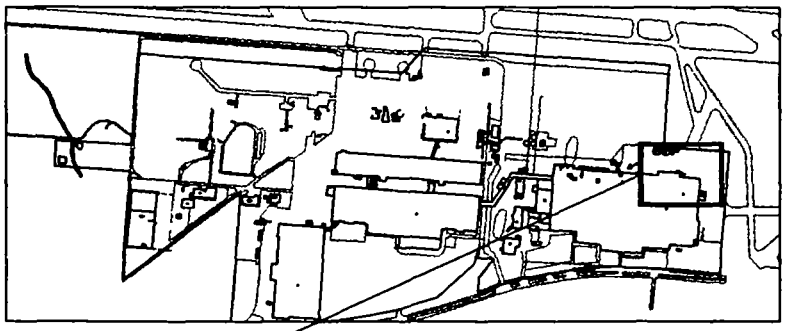
Summary of Analyte Concentrations for Groundwater Samples
Septic Tanks (SPTANK3/SPTANK4)

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	SPTANKGW-03N 02/22/1999	SPTANKGW-05N 02/22/1999
Analyte	**Inorganics (Total) by SW6010 (ug/L)**		
Aluminum	16000	2800	3700
Arsenic	50	4 U	4.1
Barium	2000	130	110
Iron	NA	7100	11000
Lead	NA	5.2	5.1
Manganese	NA	660	330
Zinc	4700	38	52
Analyte	**Volatiles by SW8260 (ug/L)**		
Chlorobenzene	100	5 U	5 U
Analyte	**TPH by M8015 (ug/L)**		
PHC C16-C32	NA	160 J	600 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
J = Estimated
NA = Not available.
U = Not detected
ug/L = Micrograms per Liter





Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 25' 50' 100'

SCALE

EARTH TECH

Figure 4.21-1

UST 3-105
Soil and Groundwater
Sample Locations

29179.4.20-25.DWG/.PLT

Numerous SVOCs and TPH were detected in the groundwater samples collected at UST 3-105; concentrations are presented in Table 4.21-3. Benzo(a)anthracene and benzo(b)fluoranthene were detected concentrations that exceeded the respective VAP standard.

4.21.4 Data Validation Summary

Six soil samples, two soil duplicates and three groundwater samples were collected at UST 3-105 and were analyzed for SVOCs and TPH (GRO and DRO). The non-detect result for benzoic acid for one soil sample (105DP-0301N) and the result for hexachlorocyclopentadienedue for the soil sample 105DP-0502N were qualified R and rejected due to low percent recovery of matrix spikes and a high RPD between matrix spike and matrix spike duplicate results. More than 56% of the TPH (GRO and DRO) data points for soil samples were estimated due to low percent recovery of matrix and surrogate spikes.

All groundwater data points are useable. All soil samples are useable except for the rejected results described above. The following provides a summary of data validation results for samples collected at UST 3-105:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
SVOCs	528	2	99.6%	9.9%	0%
TPH (GRO and DRO)	16	0	100%	56.3%	0%
Groundwater					
SVOCs	198	0	100%	8.6%	0%
TPH (GRO and DRO)	6	0	100%	16.7%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.

(2) The percentage of blank contamination includes both field and laboratory blanks.

4.21.5 Recommendations for Further Action

As discussed in Section 4.21.3, benzo(a)anthracene and benzo(b)fluoranthene were detected at concentrations exceeding the respective generic potable use standards. In accordance with OAC 3745-300-07 (D)(2), complete pathways must be determined for UST 3-105. The potentially complete pathway is exposure to groundwater containing chemicals of concern which have leached from soil.

To determine whether PAHs in soil are leaching to groundwater, additional sampling is recommended in the vicinity of the elevated PAH hits. One borehole and one monitoring well are proposed within a 20-foot radius of 105DP-03. The boreholes should be drilled to groundwater. Soil will be sampled every 5 feet and groundwater will be sampled. Samples will be analyzed for benzo(a)anthracene and benzo(b)fluoranthene only. Proposed borehole locations are shown in Figure 4.21-1. This additional sampling will determine the vertical and horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

UST 3-105 is recommended for Category 7 designation.

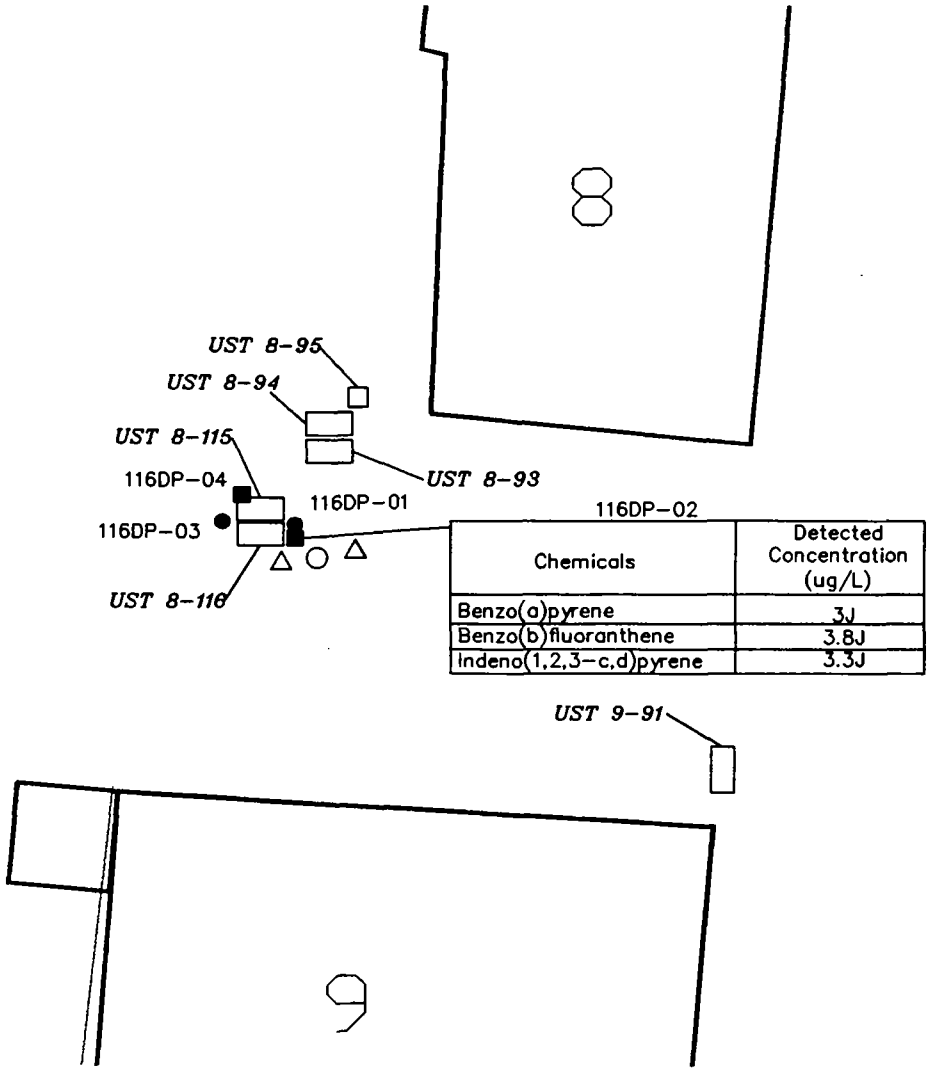
Table 4.21-3

Summary of Analyte Concentrations for Groundwater Samples
UST 3-105

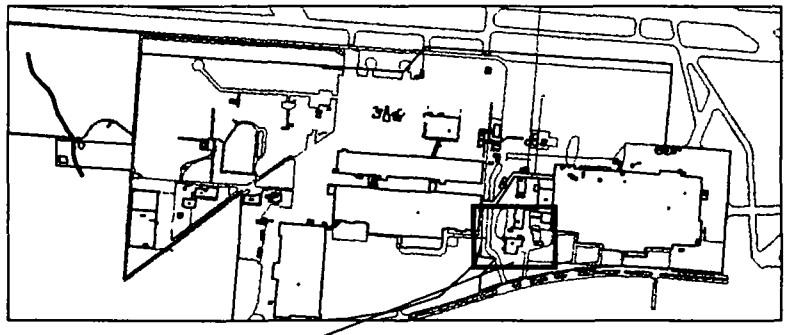
Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	105GW-01N 02/17/1999	105GW-03N 02/17/1999	105GW-04N 02/17/1999
Analyte	**Semivolatiles by SW8270 (ug/L)**			
2-Methylnaphthalene	2300	19 J	6 J	10 U
Benzo(a)anthracene	0.29	3.2 J	1.5 J	10 U
Benzo(b)fluoranthene	0.21	3.2 J	1.4 J	10 U
bis(2-Ethylhexyl)phthalate	NA	13 J	250	2.1 J
Chrysene	29	5.4 J	2.3 J	10 U
Fluoranthene	300	7.5 J	3.9 J	10 U
Fluorene	410	2.7 J	11 U	10 U
Phenanthrene	2600	5.6 J	4.3 J	10 U
Pyrene	190	6.6 J	3.7 J	10 U
Analyte	**TPH by M8015 (ug/L)**			
PHC as Gasoline	NA	6100	23000	720
PHC C16-C32	NA	3900	35000	2200

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
J = Estimated
NA = Not available.
U = Not detected
ug/L = Micrograms per Liter



Chemicals	Detected Concentration (ug/L)
Benzo(a)pyrene	3J
Benzo(b)fluoranthene	3.8J
Indeno(1,2,3-c,d)pyrene	3.3J



Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location

0' 25' 50' 100'

SCALE

EARTH TECH

Figure 4.27-1

UST 8-116
Soil and Groundwater Sample Locations

Numerous SVOCs were detected in one of the two groundwater samples collected at UST 8-116 and TPH was detected in both samples; concentrations are presented in Table 4.27-3. Benzo(a)pyrene, benzo(b)fluoranthene, and indeno[1,2,3-c,d]pyrene were detected at concentrations that exceeded the respective VAP standard.

4.27.4 Data Validation Summary

Ten soil samples, two soil duplicates and two groundwater samples were collected at UST 8-116 and were analyzed for SVOCs and TPH (GRO and DRO). All soil and groundwater data points are useable. The following provides a summary of data validation results for samples collected at UST 8-116:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
SVOCs	768	0	100%	11.6%	0%
TPH (GRO and DRO)	24	0	100%	4.2%	0%
Groundwater					
SVOCs	128	0	100%	3.9%	0%
TPH (GRO and DRO)	4	0	100%	0%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.

(2) The percentage of blank contamination includes both field and laboratory blanks.

4.27.5 Recommendations for Further Action

As discussed in Section 4.27.3, numerous PAHs were detected at concentrations exceeding the respective potable water use standards. In accordance with OAC 3745-300-07 (D)(2), complete pathways must be determined for UST 8-116. The potentially complete pathway is exposure to groundwater containing chemicals of concern which have leached from soil. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.
- Inhalation of VOCs released if groundwater is used for bathing/showering or inhaled incidentally during other potable or process use by receptors.

To determine whether PAHs in soil are leaching to groundwater, additional sampling is recommended. Two boreholes are proposed within a 20-foot radius of 116DP-02. The boreholes should be drilled to groundwater. Soil will be sampled every 5 feet and groundwater will be sampled. Samples will be analyzed for benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene DRO only. One monitoring well will also be installed downgradient of 116DP-02. Proposed borehole locations are shown in Figure 4.27-1. This additional sampling will determine the vertical and horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

UST 8-116 is recommended for Category 7 designation.

Table 4.27-3

Summary of Analyte Concentrations for Groundwater Samples
UST 8-116

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	116GW-02N 02/15/1999	116GW-04N 02/15/1999
Analyte	**Semivolatiles by SW8270 (ug/L)**		
Benzo(a)pyrene	0.021	3 J	10 U
Benzo(b)fluoranthene	0.21	3.8 J	10 U
Benzo(g,h,i)perylene	63	10	10 U
bis(2-Ethylhexyl)phthalate	NA	7.2 J	10 U
Chrysene	29	3.9 J	10 U
Indeno(1,2,3-c,d)pyrene	0.14	3.3 J	10 U
Pyrene	190	3.5 J	10 U
Analyte	**TPH by M8015 (ug/L)**		
PHC as Gasoline	NA	100 U	1500
PHC C10-C22	NA	3400	100 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
J = Estimated
NA = Not available.
U = Not detected
ug/L = Micrograms per Liter

at elevated concentrations exceeding the VAP standard. This exceedance appears to be limited to the shallow soil samples collected from boring 91DP-03. Figure 4.28-1 shows the location where soil samples were collected, as well as where exceedances of VAP-adjusted standards exist. Five borings were advanced at 125-FBA-3; depths ranged from 7 to 24 feet bgs. The soils encountered varied from yellow brown/brown clayey silt to silty clay, with gravel and sand. Groundwater was reached at 20 feet bgs in two borings. No sample for vertical conductivity determination was collected. However, a value of 7.38×10^{-7} cm/s was reported at nearby UST 9-91.

Numerous SVOCs were detected in groundwater sample 91GW-01; concentrations are presented in Table 4.28-3. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno[1,2,3-c,d]pyrene were detected at concentrations that exceeded the respective VAP unrestricted potable use standards. Figure 4.28-2 shows the location where samples were collected.

Soils encountered ranged from an olive sandy clay to a olive gray silty clay mixed with some sand and gravel. A vertical conductivity value of 7.3810^{-7} cm/s was reported for the sample from boring 91DP-04 collected at 4-8 feet bgs. This it typical of glacial till unconsolidated deposits. Based on the observed clay content of soils encountered within the UST 9-91 borings, and the low conductivity, the potential for contaminant leaching to groundwater is limited. Further investigation at this site will be conducted to assess the potential of contaminant migration to groundwater.

4.28.4 Data Validation Summary

Seven soil samples, two soil duplicates and two groundwater samples were collected at UST 9-91 and were analyzed for SVOCs and TPH (GRO and DRO).

All SVOC detects were qualified J for one groundwater samples (91GW-01N) due to SVOC holding time exceedance and all base neutral compounds were qualified R and rejected due to a low percent recovery of surrogate spikes. Detects of 2-methylnaphthalene and phenanthrene for samples 91DP-0401N and 91DP-0401D were qualified R and rejected because the sample results exceeded calibration ranges.

All soil and groundwater data points are useable except for the rejected results described above. The following provides a summary of data validation results for samples collected at UST 9-91:

Analysis	Total Number of Data Points	Number of Rejected Data Points	Completeness	Estimated Values(1)	Blank Contamination(2)
Soil					
SVOCs	576	3	99.5%	11.7%	0%
TPH (GRO and DRO)	18	0	100%	11.1%	0%
Groundwater					
SVOCs	128	29	77.3%	9.3%	0%
TPH (GRO and DRO)	4	0	100%	0%	0%

(1) The percentage of estimated values includes estimated non-detect and detected data points.

(2) The percentage of blank contamination includes both field and laboratory blanks.

Table 4.28-3

Summary of Analyte Concentrations for Groundwater Samples
UST 9-91

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	91GW-01N 02/15/1999	91GW-05N 02/15/1999
Analyte	**Semivolatiles by SW8270 (ug/L)**		
2-Methylnaphthalene	2300	6.4 J	10 U
Acenaphthene	680	7 J	10 U
Anthracene	2600	7.3 J	10 U
Benzo(a)anthracene	0.29	7 J	10 U
Benzo(a)pyrene	0.021	6.6 J	10 U
Benzo(b)fluoranthene	0.21	8 J	10 U
Benzo(g,h,i)perylene	63	5.8 J	10 U
bis(2-Ethylhexyl)phthalate	NA	15 J	10 U
Carbazole	62	4.6 J	10 U
Chrysene	29	11 J	10 U
Dibenzofuran	NA	3.8 J	10 U
Fluoranthene	300	18 J	10 U
Indeno(1,2,3-c,d)pyrene	0.14	4.9 J	10 U
Naphthalene	NA	4 J	10 U
Phenanthrene	2600	14 J	10 U
Pyrene	190	29 J	10 U

Table 4.28-3

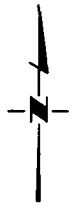
Summary of Analyte Concentrations for Groundwater Samples (Continued)
UST 9-91

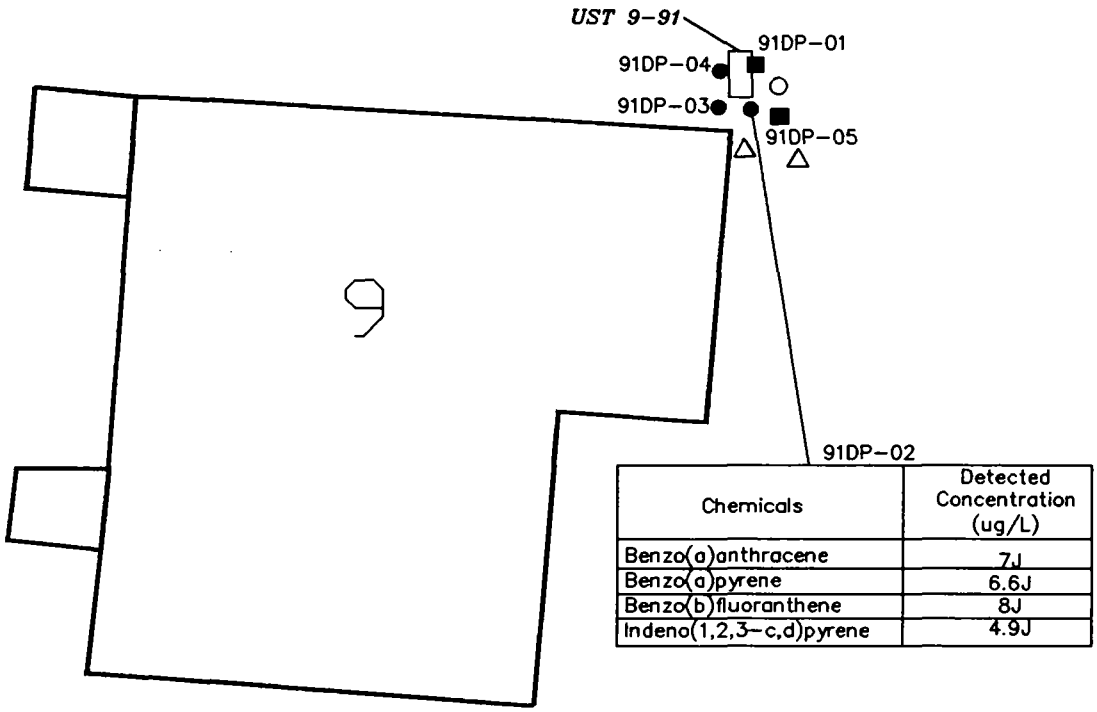
Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	91GW-01N 02/15/1999	91GW-05N 02/15/1999

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:

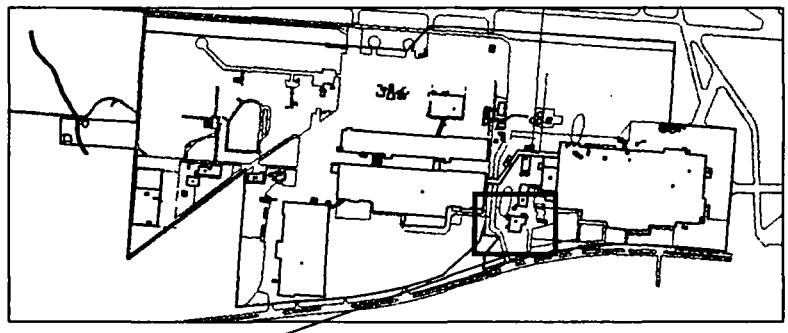
J	=	Estimated
NA	=	Not available.
U	=	Not detected
ug/L	=	Micrograms per Liter





Chemicals	Detected Concentration (ug/L)
Benzo(a)anthracene	7J
Benzo(a)pyrene	6.6J
Benzo(b)fluoranthene	8J
Indeno(1,2,3-c,d)pyrene	4.9J

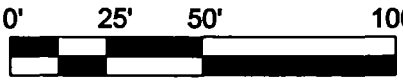
Groundwater Flow



Area of Interest

Legend

- ● Direct Push Sample Location
- ■ Groundwater Sample Location
- △ Proposed Borehole Location
- ○ Proposed Well Location



EARTH TECH

Figure 4.28-2

UST 9-91
Groundwater Sample Locations and Concentrations (ug/L)

29179.4.28-31DWG/.PLT

4.28.5 Recommendations for Further Action

As discussed in Section 4.28.3, numerous PAHs and DRO were detected at concentrations exceeding the adjusted VAP soil standards.

In accordance with OAC 3745-300-07 (D)(2), complete pathways must be determined for UST 9-91. The potentially complete pathway is exposure to groundwater containing chemicals of concern which have leached from soil. On-site or off-site receptors may be exposed to groundwater in the following ways:

- Ingestion of chemicals of concern if groundwater is used as a drinking water source.
- Dermal contact with chemicals of concern if groundwater is used for bathing/showering or is contacted incidentally during other potable or process use by receptors.
- Inhalation of VOCs released from groundwater if groundwater is used for bathing/showering or inhaled incidentally during other potable or process use by receptors.

To determine whether PAHs in soil are leaching to groundwater, additional sampling is recommended in the vicinity of the elevated PAH hits. Two boreholes are proposed within a 20-foot radius of 91DP-03, and one monitoring well is proposed adjacent to 91DP-01. The boreholes should be drilled to groundwater. Soil will be sampled every 5 feet and groundwater will be sampled. Samples will be analyzed for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and DRO only. Proposed borehole and well locations are shown in Figure 4.28-2. This additional sampling will determine the vertical and horizontal extent of contamination. On the basis of this determination, either a baseline risk assessment or further sampling will be conducted.

UST 9-91 is recommended for Category 7 designation.

Table 4.30-3

Summary of Analyte Concentrations for Groundwater Samples
UST 270-289

Sample ID Date Sampled	VAP Generic Unrestricted Potable Use Standard	289GW-01N 02/17/1999	289GW-03N 02/17/1999	289GW-04N 02/18/1999
Analyte	**Semivolatiles by SW8270 (ug/L)**			
bis(2-Ethylhexyl)phthalate	NA	42	10 U	10 U
Chrysene	29	2.7 J	10 U	10 U
Fluoranthene	300	3.2 J	10 U	10 U
Phenanthrene	2600	1.5 J	10 U	10 U
Pyrene	190	3 J	10 U	10 U
Analyte	**TPH by M8015 (ug/L)**			
PHC C16-C32	NA	550 J	650 U	600 U

Note: Shaded cells indicate that the chemical was quantified at a concentration that exceeds the VAP Generic Unrestricted Potable Use Standard.

Key:
J = Estimated
NA = Not available.
U = Not detected
ug/L = Micrograms per Liter